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# PATENT ABSTRACTS OF JAPAN

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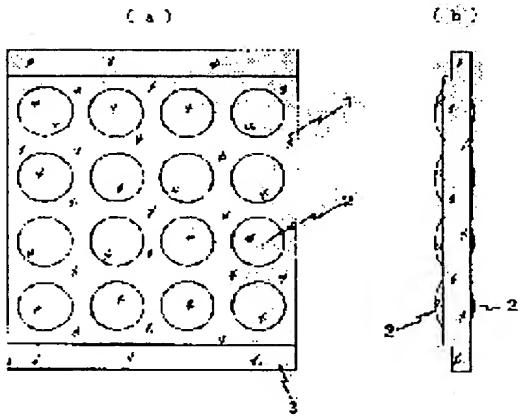
(71)Applicant : KONICA CORP
(72)Inventor : HOSOE HIDE

## (54) PRODUCTION OF OPTICAL ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To efficiently and inexpensively mold an optical element of high accuracy.
SOLUTION: In a method for producing an optical element by a molding method, a plurality of optical elements 2 are integrally molded and cut off after molding to form independent optical elements. A molded object 1 is attached to a jig as it is by stepped parts 3 to be subjected to processing such as coating treatment and subsequently cut off to form independent optical elements. By this constitution, the handling of the optical elements during processing becomes extremely easy.

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CLAIMS

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[Claim(s)]

[Claim 1] A manufacture method of an optical element characterized by fabricating two or more optical elements in a configuration which adjoined mutually and has been arranged to one, separating them to each optical element after shaping, and using them as an independent optical element in a manufacturing method of an optical element by the mold method [Claim 2] A manufacture method of an optical element characterized by carrying out coating processing to one side or both sides of an optical element with one, separating after that two or more optical elements fabricated by one to each optical element, and using them as an independent optical element in a manufacture method of an optical element of above-mentioned claim 1 [Claim 3] It is the manufacture method of an optical element of claim 1 characterized by performing one shaping of two or more above-mentioned optical elements by injection molding, or claim 2. [Claim 4] It is the manufacture method of an optical element of claim 1 characterized by one shaping of two or more above-mentioned optical elements being performed by glass mold, or claim 2. [Claim 5] A manufacture method of an optical element of either claim 1 characterized by fabricating a non-optical element portion for handling at one at the edge of an one Plastic solid of two or more above-mentioned optical elements thru/or claim 4 [Claim 6] A manufacture method of an optical element of either claim 1 characterized by fabricating simultaneously a mark used as aim for separating each optical element independently to an one Plastic solid of two or more above-mentioned optical elements at the time of optical surface shaping thru/or claim 5 [Claim 7] A manufacture method of an optical element of either claim 1 characterized by using as a square an optical element configuration separated to the above-mentioned independent one thru/or claim 6

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the manufacture method of an optical element, and the manufacture method of an optical element of having been especially suitable for manufacture of the optical element of a minute configuration.

[0002]

[Description of the Prior Art] Shaping optical elements, such as a plastic lens and a glass mold lens, were fabricated as an optical element which has the same configuration as a product configuration with independent shaping metal mold conventionally as shown in drawing 5 . In order to produce an optical element efficiently by this shaping method, conventionally, two or more nests of optical element shaping metal mold were included in one die set metal mold, and the way only the number of nested fabricates an independent optical element by one shaping has become common as multi-cavity mo ld. In this case, since it was fabricated by the product configuration with each optical element cavity independent at the time of shaping, in the case of the plastics injection-molding optical element, the runner for supplying resin to each nest was prepared in metal mold. and the optical element of a product configuration was located at the branched runner's head. Therefore, except separating an optical element from a runner, after shaping was not accompanied by special machining, but had the merit that an after process was simple.

[0003] However, by this method, the resin material of portions other than the optical element called the runner and spool will become useless. Moreover, if a runner's path was not able to be made not much small but it became a small optical element, in order not to check the flow of resin, since a runner's rate of a volume ratio became very large compared with a lens and metal mold near the runner was not able to get cold easily with the heat of resin. it was easy to produce the thermal imbalance of an optical element shaping cavity, and since it became difficult to carry out cooling solidification at homogeneity. nonconformity had been produced when fabricating the optical element of high degree of accuracy.

[0004] In the glass mold optical element of the conventional method, although much shaping with a picking mold was performed similarly. the primary operation glass member currently called preforming to each cavity was supplied. and they were taken out with the gestalt of the independent optical element of a product configuration after shaping. However. with the miniaturization of an optical element, preforming also becomes small and handling becomes difficult. Therefore. it was low as the shaping picking number of reliability of supply or extraction increased. Moreover. in the glass mold, since it became shaping in an elevated temperature. the time amount which heating and cooling take was long. and the cycle of shaping

became long and caused the cost high.

[0005]

[Problem(s) to be Solved by the Invention] Conventionally [ these ], by the fabricating method, since shaping was performed as an independent optical element of a product configuration, for the object which is after processes, such as acid resisting and protection, the coat processing performed to an optical element front face also attached shaping optical elements in the fixture one by one, and was performed to the vacuum evaporationo machine etc. When the optical element became very small, since this activity had the coat fixture close to optical measuring area which it not only takes time and effort dramatically, but supports the optical non-measuring area of an optical element, a part of optical surface might become shade to the source of vacuum evaporationo, and coat processing might become nonuniformity. If the magnitude of an optical element becomes small, it will become a rapidly big problem, and in an optical element with a diameter of about 0.5mm, the additional coverage for holding almost to a coat fixture on an optical element is lost. Furthermore, it was dramatically difficult for the optical element small in this way to convey, deciding each direction and sense, since it adheres easily with static electricity, or to fix. The trouble in such conventional technology can be conventionally called fundamental technical problem of fabrication technology based on the shaping gestalt of an optical element. This invention conquers these troubles and aims at fabricating and manufacturing an efficient optical element with a high precision.

[0006]

[Means for Solving the Problem] A manufacture method of an optical element of this invention is characterized by fabricating two or more optical elements in a configuration which adjoined mutually and has been arranged to one, separating to each optical element after shaping, and considering as an independent optical element in a manufacturing method of an optical element by the mold method. A gap is set mutually and arrangement of an optical element on a Plastic solid may be arranged, even if an optical surface adjoins mutually.

[0007]

[Embodiment of the Invention] As for two or more optical elements fabricated by the up Norikazu object, it is desirable to process coating processing etc. on one side or both sides of an optical element with one, to separate to each optical element after that, and to consider as an independent optical element. Thereby, the handling of the optical element in a processing process becomes very easy. Moreover, it is desirable to fabricate simultaneously the mark used as the examination when separating an optical element at the time of optical surface shaping. Thereby, the accumulated error when separating an optical element one by one and going is avoidable. And these manufacture methods are advantageous when manufacturing a small optical element with injection molding especially.

[0008]

[Example] Hereafter, with reference to a drawing, this invention is explained to details about an example. One example of the shaping gestalt of the lens by this invention is shown in drawing 1 . This extends a part for the flange 11 of the conventional lens 10 shown in drawing 5 . and is equivalent to what unified 16 pieces. The level difference section 3 is the portion for using as the grasping section at the time of anchoring to a fixture. or conveyance prepared in the suitable part of Plastic solid 1. 2 is an optical surface. Although an optical surface 2 sets a gap and is arranged in the example of a graphic display. it is not necessary to say that it may adjoin mutually and you may be located. Plastic solid 1 is the gestalt of

this as, and if there is need, coats, such as acid resisting, washing, etc. will be made, and it is cut eventually, and let it be the independent optical element product 4 ( drawing 3 ).

[0009] As for cutting precision, about 10 micrometers is obtained easily that cutting should just use the dicing saw used for cutting of a semiconductor wafer etc. At this time, a resin material is applied to the really fabricated optical element, or the tape is stuck and backed, if a resin material sets the amount of slitting as the depth which is not separated, an optical element does not come apart about resin, but after cutting can perform washing, conveyance, etc. with one. What is necessary is just to strip from backing resin to obtain the optical element of each. Since the physical relationship of each optical element is being fixed to the same location as the time of shaping by backing resin, this can be easily performed using a cheap automatic machine etc.

[0010] In order to raise cutting precision more, on Plastic solid 1 with which the optical element was really fabricated as shown in drawing 2 Since the accumulated error for every cutting is not included even when repetition cutting is carried out many times if the aim 5 for cutting is fabricated by the convex or concave as marks, such as a line and a point, simultaneously with an optical surface 2 and it cuts by positioning this mark using an image processing etc., The cutting plane where location precision is high is acquired to each optical surface. Thus, since the cutting plane with a sufficient location precision with an optical surface can poke and apply an optical element 4 to the criteria member 6 by the ability making this into the opposition reliance section like drawing 3 , can include it in an object and can realize little setting up of eccentricity, it can make product yield of an inclusion object high. Moreover, in using revolution unsymmetrical sides, such as a cylindrical lens, it also produces the effect referred to as being able to check the direction of a bus-bar easily by relation with a cutting plane.

[0011] Drawing 4 is the final product gestalt of the components 7 called the flying head for high density optical recording manufactured by the method of this invention. The pickup lens 2 for magnitude to be the magnitude like 1mmx2mm, and write information in an optical disk side, or for this component read is really fabricated. Conventionally, the pickup lens for optical disks fabricated the lens whose diameter is about 4mm in the simple substance configuration, and after it carried out the coat, it mounted it in components with a big detection arm head etc. by methods, such as adhesion. However, the detection arm head became small like this flying head by high-capacity-izing and densification of storage capacity in recent years. The lens diameter carried in connection with this becomes 0.5mm order, and shaping, a coat, handling, etc. have become very difficult. According to this invention, by more than one's adjoining and carrying out simultaneous shaping of the flying head united with the pickup lens, it is stabilized efficiently and thermally and can fabricate to high degree of accuracy.

[0012]

[Effect of the Invention] by the manufacture method of this invention, since it really considered as the shaping gestalt, and optical non-measuring area is inevitably alike and becomes large compared with an independent shaping gestalt, in coat processing, it can attach with additional coverage to a coat fixture. and can prevent an optical surface becoming shade by coat processing. Moreover, with that setting of 16 optical elements can be performed by anchoring to 1 time of a coat fixture in the case of drawing 1 , and a byway lens. a Plastic solid really serves as handling and cone magnitude exactly, and setting becomes easy. really cut with a Plastic solid -- since the optical element is densely located in a line in the amount of detached buildings of ****, even if it uses the same vacuum evaporationo machine, a merit. like many optical elements are set and the coat of them can be carried out rather than it sets an independent optical

element to a coat fixture arises, it is possible to gather the reliability and effectiveness of coat processing substantially, and reduction of coat processing cost can be aimed at. Especially, to a coat fixture, if the non-optical element portion installation and for becoming empty, and it being sufficient and making handling easy is really prepared in the Plastic solid so that cutting clearance can be carried out at an after process, these effects can be improved further. The more the cutting cost per independent element being reduced to several [ further / 1/] by all being able to cut elegance by straight-lines [ about 8 times of ] cutting if cutting is the one Plastic solid of drawing 1 , really putting two or more Plastic solids in order further, and cutting, etc. and an optical element become small, it can produce efficiently and cheaply and, the more has the marked outstanding effect compared with a conventional method.

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[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the conceptual diagram showing one example of the shaping gestalt of the lens by this invention.

[Drawing 2] It is the conceptual diagram showing other examples of the shaping gestalt of the lens by this invention.

[Drawing 3] It is explanatory drawing of the inclusion condition of the optical element product by this invention.

[Drawing 4] It is the conceptual diagram showing other optical element products by this invention.

[Drawing 5] It is explanatory drawing showing the configuration of the conventional lens.

[Description of Notations]

1 Plastic Solid 2 Optical Surface 3 Level Difference Section

4 Optical Element Product 5 Aim for Cutting 6 Criteria Member

7 Excitation Light Plane of Incidence 10 Lens 11 A Part for Flange

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[Translation done.]

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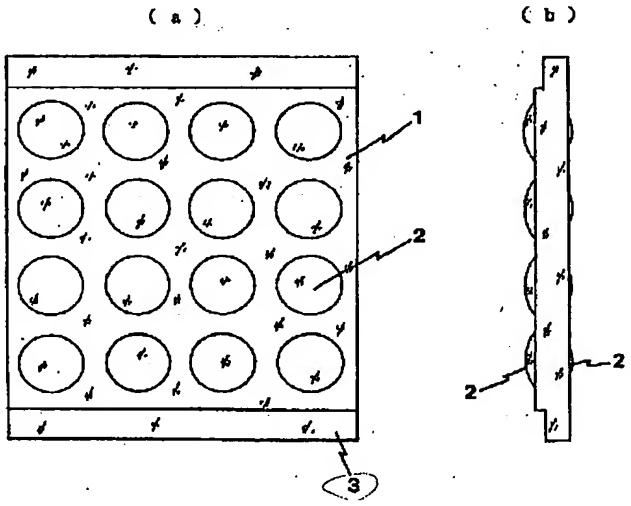
Ｆターム(参考)　4F213 AH74 WA02 WA05 WA54 WA58 WA62 WA73

(54)【発明の名称】　光学素子の製造方法

(57)【要約】
【課題】　直径０．５ｍｍ程度の光学素子では、モールドによる生産の加工精度が低下するだけでなく、後加工のための保持が難しく、さらには、静電気の影響も大きくなる。このような従来技術の根本的な課題を克服し、効率良く精度の高い光学素子を成形する。
【解決手段】　モールド法による光学素子の製造法において、複数の光学素子２を一体に成形し、成形後に各光学素子に切り離して単独の光学素子とする。成形体１は、そのまま段差部３により治具などに取付けコーティング処理などの加工を行ない、その後に各光学素子に切り離して単独の光学素子とすることにより、加工工程中の光学素子の取扱が極めて容易となる。



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【特許請求の範囲】

【請求項１】　モールド法による光学素子の製造法において、複数の光学素子を互いに隣接して配置された形状で一体に成形し、成形後に各光学素子に切り離して単独の光学素子とすることを特徴とする光学素子の製造方法

【請求項２】　上記請求項１の光学素子の製造方法において、一体に成形された複数の光学素子を、一体のまま光学素子の片面または両面にコーティング処理を行ない、その後に各光学素子に切り離して単独の光学素子とすることを特徴とする光学素子の製造方法

【請求項３】　上記複数の光学素子の一体成形は、射出成形によって行なわれることを特徴とする請求項１あるいは請求項２の光学素子の製造方法

【請求項４】　上記複数の光学素子の一体成形は、ガラスモールドによって行なわれることを特徴とする請求項１あるいは請求項２の光学素子の製造方法

【請求項５】　上記複数の光学素子の一体成形体の端部に、取扱のための非光学素子部分を一体に成形したことを特徴とする請求項１ないし請求項４のいずれかの光学素子の製造方法

【請求項６】　上記複数の光学素子の一体成形体に、各光学素子を単独に切り離すための見当となる印を光学面成形時に同時に成形することを特徴とする請求項１ないし請求項５のいずれかの光学素子の製造方法

【請求項７】　上記単独に切り離す光学素子形状を四角形としたことを特徴とする請求項１ないし請求項６のいずれかの光学素子の製造方法

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は光学素子の製造方法、特に微小な形状の光学素子の製造に適した光学素子の製造方法に関する。

【０００２】

【従来の技術】プラスチックレンズやガラスモールドレンズなどの成形光学素子は、従来、単独の成形金型により図５に示すように製品形状と同じ形状を持つ光学素子として成形されていた。この成形方法で光学素子を効率良く生産するために、従来、一つのダイセット金型に光学素子成形金型の入れ子を複数個組み込み、多数個取り金型として、一回の成形で入れ子の数だけ単独の光学素子を成形する方法が一般化している。この場合は、成形時には１つ１つの光学素子キャビティが単独の製品形状に成形されるので、プラスチック射出成形光学素子の場合は、各入れ子に樹脂を供給するためのランナーを金型内に設け、分岐したランナーの先端に製品形状の光学素子が位置していた。従って、成形後はランナーから光学素子を切り離す以外は特段の機械加工を伴わず、あと工程が簡便であるというメリットがあった。

【０００３】しかし、この方式ではランナーやスプールと云った光学素子以外の部分の樹脂材料が無駄になってしまう。また、樹脂の流れを阻害しないためにはランナーの径は余り小さくすることが出来ず、小型光学素子になると、ランナーの体積比率がレンズに比べて非常に大きくなり、ランナー近傍の金型が樹脂の熱で冷えにくいため、光学素子成形キャビティの熱的なアンバランスが生じやすく、均一に冷却固化することが難しくなるため、高精度の光学素子を成形する上で不具合を生じていた。

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【０００４】従来方式のガラスモールド光学素子では、同じように多数個取り型による成形が行なわれているが、各キャビティにプリフォームと呼ばれている一次加工ガラス部材を供給し、成形後、製品形状の単独の光学素子の形態でそれらを取りだしていた。しかし、光学素子の小型化に伴ってプリフォームも小型になり、取扱が難しくなる。そのため、供給や取りだしの信頼性が、成形取り個数が増えるにつれて低くなっていた。また、ガラスモールドでは高温での成形になるため、加熱および冷却に要する時間が長く、成形のサイクルが長くなり、コスト高の要因となっていた。

【０００５】

【発明が解決しようとする課題】これらの従来成形法では、成形が製品形状の単独の光学素子として行なわれるので、後工程である反射防止や保護などの目的で光学素子表面に施すコート処理も、蒸着機等に成形光学素子を一つ一つ治具に取り付けて行なっていた。光学素子が非常に小さくなると、この作業は非常に手間がかかるだけでなく、光学素子の光学非有効面を支えるコート治具が光学有効面に近いために、光学面の一部が蒸着源に対して蔭となり、コート処理がムラとなったりすることがあった。光学素子の大きさが小さくなると急激に大きな問題となり、直径０．５ｍｍ程度の光学素子では、光学素子上に殆どコート治具に保持するための余裕が無くなる。さらに、このように小さな光学素子は、静電気で容易に付着するため一つ一つの方向や向きを決めながら搬送したり、固定することが非常に難しかった。このような従来技術における問題点は、光学素子の成形形態に基づく、従来製作技術の根本的な課題と云えるものである。本発明は、これらの問題点を克服し、効率良く精度の高い光学素子を成形し製作することを目的とするものである。

【０００６】

【課題を解決するための手段】本発明の光学素子の製造方法は、モールド法による光学素子の製造法において、複数の光学素子を互いに隣接して配置された形状で一体に成形し、成形後に各光学素子に切り離して単独の光学素子とすることを特徴とする。成形体上での光学素子の配置は、光学面が互いに隣接していても、互いに間隔をおいて配置されていてもよい。

【０００７】

【発明の実施の形態】上記一体に成形された複数の光学

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素子は、一体のまま光学素子の片面または両面にコーティング処理などの加工を行ない、その後に各光学素子に切り離して単独の光学素子とすることが望ましい。それにより、加工工程中の光学素子の取扱が極めて容易となる。また、光学素子を切り離すときの検討となる印を、光学面成形時に同時に成形することが望ましい。それにより、順次に光学素子を切り離して行くときの累積誤差を避けることが出来る。そして、これらの製造方法は、特に小型の光学素子を射出成形によって製造する場合に有利である。

【０００８】

【実施例】以下、図面を参照して実施例について本発明を詳細に説明する。図１に、本発明によるレンズの成形形態の１例を示す。これは図５に示す従来のレンズ１０のフランジ部分１１を延長し、１６個を一体化したものに相当する。段差部３は、成形体１の適当な個所に設けられた、治具への取付けや搬送時の把持部として用いるための部分である。２は光学面である。図示の実施例では光学面２は間隔をおいて配置されているが、互いに隣接して位置されてもよいことは云うまでもない。成形体１はこのままの形態で、必要があれば反射防止などのコートや洗浄などがなされ、最終的には切断され、単独の光学素子製品４（図３）とされる。

【０００９】切断は半導体ウェハなどの切断に用いられるダイシングソーなどを用いれば良く、切断精度は１０μｍ程度が容易に得られる。このときに、一体成形された光学素子に樹脂材料を塗布したり、テープを貼るなどして裏打ちしておき、樹脂材料は分離されない深さに切り込み量を設定すると、切断後も光学素子は樹脂についてばらばらにならず、一体のままで洗浄や搬送などを行なうことが出来る。一つ一つの光学素子を得るには裏打ち樹脂からはがせばよい。これは、各光学素子の位置関係が成形時と同じ位置に裏打ち樹脂で固定されているので、安価な自動機などを用いて簡単に行なうことが出来る。

【００１０】より切断精度を高めるために、図２に示すように光学素子が一体成形された成形体１上に、光学面２と同時に切断のための見当５を凸や凹で線や点などの印として成形しておき、この印を画像処理などを用いて位置決めし切断を行なうと、多数回繰返し切断をした場合でも、切断ごとの累積誤差を含まないため、各光学面に対して位置精度の高い切断面が得られる。このように光学面との位置精度がよい切断面は、図３のようにこれを衝当て部として光学素子４を基準部材６に衝き当てて対象物に組み込むことが出来、偏心の少ない組み上げを実現できるので、組み込み対象物の製品収率を高くすることが出来る。また、シリンドリカルレンズなどの回転非対称面を用いる場合には、その母線方向を切断面との関係で容易に確認できると云う効果も生じる。

【００１１】図４は本発明の方法によって製作した高密

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度光記録用のフライングヘッドと呼ばれる部品７の最終製品形態である。この部品は大きさが１ｍｍ×２ｍｍほどの大きさで、光ディスク面に情報を書き込みあるいは読み出すためのピックアップレンズ２が一体成形されている。従来、光ディスク用のピックアップレンズは直径が４ｍｍ程度のレンズを単体形状で成形し、コートした後、検出ヘッドなどの大きな部品に接着などの方法で実装していた。しかし、近年の記録容量の高容量化と高密度化により、検出ヘッドはこのフライングヘッドのように小型となった。これに伴い搭載するレンズ直径は０．５ｍｍ前後となり、成形やコート、取扱などが非常に困難となってきた。本発明によれば、ピックアップレンズと一体化されたフライングヘッドを複数個隣接して同時成形することにより、効率良くかつ熱的に安定して高精度に成形することが出来る。

【００１２】

【発明の効果】本発明の製造方法では、一体成形形態としたので、単独成形形態と比べ、光学非有効面が必然的にに大きくなるので、コート処理ではコート治具に対して余裕を持って取り付けることが出来、コート処理で光学面が蔭になることを防ぐことが出来る。また、一回のコート治具への取付けによって、図１の場合では１６個の光学素子のセッティングが出来ること、小径レンズなどでは一体成形体がちょうど取扱いやすい大きさとなり、セッティングが容易になる。一体成形体では切断しろだけの離れ量で密に光学素子が並んでいるので、同じ蒸着機を使っても単独の光学素子をコート治具にセットするよりは多くの光学素子をセットしコートできるなどのメリットが生じ、コート処理の信頼性と効率を大幅に上げることが可能で、コート処理コストの低減が図れる。特に、コート治具に取り付けやすくしたり、取扱を容易にするための非光学素子部分を、後工程で切断除去できるように一体成形体に設けておくと、これらの効果をさらに向上することが出来る。切断は、図１の一体成形体であれば、８回程度の直線切断で全部品を切断出来、さらに一体成形体を複数個並べておいて切断することにより、単独素子あたりの切断コストはさらに数分の一に低減することが出来るなど、光学素子が小型になればなるほど、効率よく安価に生産でき、従来法に比べて格段の優れた効果を有するものである。

【図面の簡単な説明】

【図１】本発明によるレンズの成形形態の１例を示す概念図である。

【図２】本発明によるレンズの成形形態の他の例を示す概念図である。

【図３】本発明による光学素子製品の組み込み状況の説明図である。

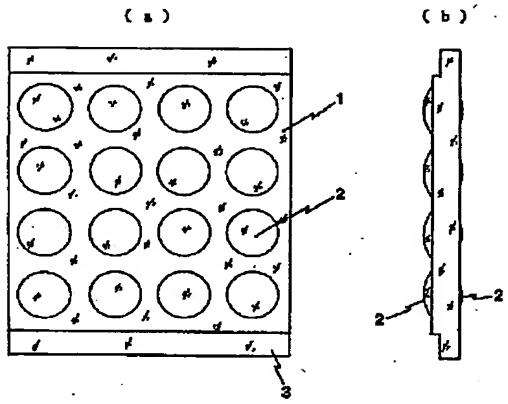
【図４】本発明による他の光学素子製品を示す概念図である。

【図５】従来のレンズの形状を示す説明図である。

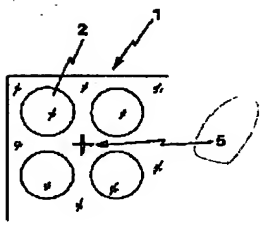
【符号の説明】

1 成形体　2 光学面　3 段差部　4 光学素子製品　5 切断用見当　6 基準部材　7 励起光入射面　10 レンズ　11 フランジ部分

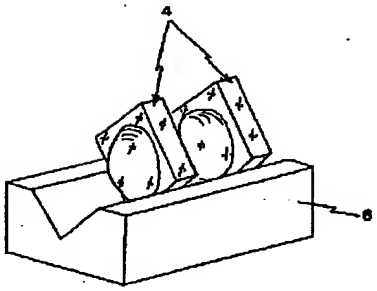
【図1】



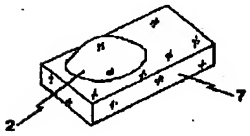

【図2】




【図3】




【図4】




【図5】